ON THE GROWTH OF THE BARLEY APEX.

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F. B. NICHOLLS B.Sc. Hons.

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ABSTRACT

An investigation was carried out on the growth and development of the spring barley apex from shortly after germination to shortly before heading. The influences of both daylength and increasing soil moisture tension on the various measures, viz. (i) number of primordia (ii) length of the apex, (iii) inflorescence, spikelet and early leaf development were studied in controlled conditions of temperature and humidity.

It was observed that there are two major changes in the pattern development of the apex viz. (i) the initiation of double ridges and (ii) the initiation of internode elongation. The initiation of double ridges was found to have occurred by the time the apex had reached a specific length. Changes in the environment up to this time appeared to have controlled the rate of increase in apex length in a quantitative manner. The initiation of internode elongation was found to have occurred at the first appearance of stamen initials on the most advanced spikelet. The cessation of primordia formation was observed to be correlated with the initiation of internode elongation. Both of these changes were found to be initiated irrespective of the general rate of growth of the plants in a particular environment, providing that the necessary morphological conditions had been met. These observations have led to the conclusion that the apex has within its own structure the necessary factors for initiating both double ridges and internode elongation.

An examination of the cytological and hormonal changes surrounding the initiation of internode elongation was carried out to obtain further evidence on the mechanism of this event. It was found that cell
Abstract. (cont.).

Division in the pith tissues of the internodes of the inflorescence was initiated immediately following the appearance of stamen initials and this phase of cell division had similar features to those which had been described in some dicotyledonous rosette plants. These observations were followed by the determinations of activities of gibberellin-like substances in apices before, during and subsequent to the initiation of internode elongation.

A new method of bioassay for gibberellins in plant material was developed and was found to be considerably more sensitive than previously described methods. This new technique enabled estimations of gibberellin-like substances from small quantities of barley inflorescences to be determined. It was found that a peak in the specific activity of these substances occurred in the apex at the initiation of internode elongation. This result is in agreement with the previously known results from dicotyledonous rosette plants. But it is still not known why a certain amount of floral development is necessary in the spring barley (a monocotyledonous plant) before internode elongation is initiated, in contrast with the dicotyledonous plant, in which the initiation of internode elongation occurs at, or prior to, flower initiation.